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Title of Invention	In circuit emulator based on the web, developmentsystem and method based on the web of target embeddedsystem using it



Abstract

In circuit emulator in which the web server is built is connected to the invention between the host system and the target embedded system supporting with the web browser through interface. In circuit emulator based on the web providing the development environment of the target embedded system through the web page which connects with the web browser in the host system to circuit emulator based on the web and which is built in, and the development system based on the web of the target embedded system using this and offer of method are provided to purpose.

As to circuit emulator based on the web of the present invention for achieving purpose, in circuit emulator the web server is built in as to circuit emulator which is equipped with the host system for the development of the target embedded system and target embedded system and interface and provides the development environment of the target embedded system. It connects with the web browser provided from the host system to the web page of the web server. It characterizes to the web page develop the target embedded system and it is comprised.



Representative Drawing(s)

Fig. 1



### Keyword(s)

The embedded system, debugging, in circuit emulator, web browser, web server, internet.



### Description

#### ■ Brief Explanation of the Drawing(s):

Figure 1 is a block diagram showing the whole configuration of the development system based on the web of the target embedded system according to a preferred embodiment of the present invention.

Figure 2 shows the software structure of the web server application which is built in circuit emulator based on the web according to the invention.

Figure 3 shows the total operating process of the development system based on the web of the target embedded system of fig. 1.

Figure 4 shows the example of change execution of the development system based on the web of the target embedded system of fig. 1.

The description > of the denotation about the main part of • drawing.

1: host system 11: web browser.

2: in circuit emulator based on the web 21: host interface.

22: web server built in emulator 221: CPU.

222, 32: memory 3: target embedded system.

31: target processor 311: TAP controller.

312: CPU core.

313: in circuit emulator breakers.

#### ■ Details of the Invention

#### ■ Purpose of the Invention

• The Technical Field to which the Invention belongs and the Prior Art in that Field

The invention relates to circuit emulator based on the web which the web page which is built in circuit emulator based on the web connected regardless of the kind of the kinds of machines of the host system or the operating system through the web browser of the host system provides the development environment of the target embedded system, and the development system based on the web and method of the target embedded system using this.

Generally, the embedded system refers to the system of the special purpose for of performing only the task which fits with the inherent function of the control equipment or mechanism while the basic operating system kernel is included to the system which is mounted in the control equipment or mechanism Including the assumption, used as the computer providing the various function of the general purpose building, factory etc. and is handled in gear and is standardized. It accommodates the demand of not only the industrial but also the general user to the support of the visual expression using diversification and intellectualization of function, and support and graphic user interface (it says to be "GUI" less than Graphic User Interface :) of various interfaces.

In order that the development of this embedded system is performed, the target embedded system for developing in the host system is connected. Compile, assembling, and linking are performed and the execution file for the development of the target embedded system etc. are generated in the host system and it transmits to the target embedded system.

In this case, so that the most of tool for the embedded system development provide the GUI environment, the browser of exclusive develops and it uses.

Moreover, in order that the development of the target embedded system is performed through the browser of this exclusive, in circuit emulator is connected between the host system and target embedded system, or the program for the communications of the host system has to be built in memory of the target embedded system in other words.

But the specific in circuit emulator supports the most of GUI tool of the exclusive for the embedded system development as in the aboves. And if moreover, the operating system of the host system is turned, the GUI tool fitting for the new operating system is bought and it has to install in the host system. The time and the effort of being many are required so that user be well acquainted because the use circumstance is sweet at the new GUI tools.

In the meantime, in the most of host systems, the web browser connecting to internet regardless of the kind of the kinds of machines or the operating system and can search the various forms of datas prepared to the web standard language of the HTML, XML, CGI, perl etc in the anywhere in world is included.

#### ■ The Technical Challenges of the Invention

In order to solve the problem the tool field for the conventional embedded system development has to use the browser of exclusive in order to provide the GUI environment, of being generated, the invention is worked out. In circuit emulator in which the web server is built is connected between the host system and the target embedded system supporting with the web browser through interface. In circuit emulator based on the web providing the development environment of the target embedded system through the web page which connects with the web browser in the host system to circuit emulator based on the web and which is built in, and the development system based on the web of the target embedded system using this and offer of method are provided to purpose.

#### ■ Structure & Operation of the Invention

As to circuit emulator based on the web of the present invention for achieving purpose, in circuit emulator the web server is built in as to circuit emulator which is equipped with the host system for the development

of the target embedded system and target embedded system and interface and provides the development environment of the target embedded system. It connects with the web browser provided from the host system to the web page of the web server. It characterizes to the web page develop the target embedded system and it is comprised.

Preferably, it may be acceptable that the thing including the memory that in circuit emulator having the web server built-in stores the program about the execution of the CPU, enforcing the operating system for the offer of the web based development environment of the target embedded system, including, the conversion of the protocol for communications between execution and the host system and target embedded system etc. and above CPU etc is characterized and it is comprised.

Moreover, the web based in circuit method for emulating of the present invention for achieving purpose builds the web server within in circuit emulator which is equipped with the host system for the development of the target embedded system and target embedded system and interface and provides the development environment of the target embedded system. It connects with the web browser provided from the host system to the web page of the web server. It characterizes to the web page develop the target embedded system and it is comprised.

Moreover, the host system, and in circuit emulator based on the web are included. In circuit emulator based on the web is connected to the host system and target embedded system to each interface. It connects to the web page of in circuit emulator based on the web as the web browser in the host system. It characterizes to transmit file etc. to the target embedded system from the web page and generated in the host system it is comprised. As to the host system, the web browser producing the file for the development of the target embedded system etc. the development system based on the web of the target embedded system of the present invention for achieving purpose is supported. As to circuit emulator based on the web, the web server transmitting file etc. in the target embedded system and generated in the host system provides the development environment of the target embedded system is built in.

Preferably, it may be acceptable that after file etc. are in read through the host interface and the electrical transmission goes through the conversion of protocol to the target embedded system including file etc. in the web page of in circuit emulator based on the web, generated in the host system it characterizes to transmit to the target embedded system through the target interface and the electrical transmission is comprised.

Preferably, it may be acceptable that USB interface, the serial interface, and the Ethernet interface or the to be one among the wireless LAN interface and thing are characterized the host interface connecting the host system and in circuit emulator based on the web is comprised.

Preferably, it may be acceptable that characterize that the target interface connecting is in circuit emulator based on the web and target embedded system the JTAG interface and it is comprised.

Moreover, the web based development method of the target embedded system of the present invention for achieving purpose connects to the web page of in circuit emulator based on the web in which the web server providing the development environment of the target embedded system to the web browser is built in the host system in which the web browser producing the file for the development of the target embedded system etc. is supported. It characterizes to transmit file etc. to the target embedded system from the web page and generated in the host system it is comprised.

Preferably, it may be acceptable that after file etc. are in read through the host interface and the electrical transmission goes through the conversion of protocol to the target embedded system including file etc. in the web page of in circuit emulator based on the web, generated in the host system it characterizes to transmit to the target embedded system through the target interface and the electrical transmission is comprised.

Above statement of the present invention, the miscellaneous feature, advantage and form perspicuously will be able to know from in circuit emulator based on the web according to the invention which hereinafter it illustrates,

and the development system based on the web of the target embedded system using this and preferred embodiment of method.

Figure 1 is a block diagram showing the whole configuration of the development system based on the web of the target embedded system according to a preferred embodiment of the present invention. The host system (1) in which the web browser is supported, and in circuit emulator based on the web (2) and the target embedded system (3) in which the web server is built are connected to the whole development system based on the web through interface.

Firstly, the personal computer is usually used as the host system (1). And PDA like PDA in which portability is guaranteed can be used. While it uses the software including the file system management, editor, assembly, cross compiler and debugging etc, while the web browser (11) is supported, this host system (1) develops the target embedded system (3). Interface between user and in circuit emulator based on the web (2) are managed while displaying the related information to user.

It is comprised of web server built in emulator (22), and target interface (23) consisting of the web based emulator (2), is the host interface (21), and the CPU (221) and memory (222). The target embedded system (3) is effectively developed.

As to the host interface (21), in order to provide the various communications path as the communications means for the communications of the host system (1) it interfaces the host system (1) and in circuit emulator based on the web (2). And communications between these is performed through the serial port, parallel port, the wireless LAN, the Ethernet etc.

The web server built in emulator (22) is made of the memory (222) of storing the webserver function and the CPU (221) which at the same time, performs in circuit emulator function and relative program and BIOS or the execution file etc.

In the memory (222), the web server application is performed with the storage. It classifies according to the flash memory storing BIOS and web server application software and the system memory which the web server application software can practice and the storage can be comprised.

Here, the web page which is prepared in order to provide the development environment of the target embedded system (3) is built in the memory (222).

Figure 2 shows the software structure of the web server application which is built in the memory (222).

The hardware platform means the CPU (221) which is the processor for the embedded in which the various communications module is built in like the Ethernet, which uses in circuit emulator based on the web (2) HDLC, UART etc. and serving the general I/O port.

The device driver is stored in the memory (222) on the hardware platform of in circuit emulator based on the web (2). It is the software for interface with the operating system managing the hardware platform. Ethernet, HDLC, UART, including, the communication-use device driver and ROM, RAM, the flash file system etc. corresponds to.

The device driver, immediately, the layers is the protocol layer provided from the operating system. The application program interface (Application Program Interface: API) can be provided between web based application protocols and high position debug application in order to make the debug application development of the web based easy.

The target interface (23) interfaces the target embedded system (3) and in circuit emulator based on the web (2) in order to provide the communications path as the communications means for the communications of the

target embedded system (3). And communications between these is performed through the joint test access group port.

While having in circuit emulator breakers (313) which is the set of the comparators and the register which is used so that the target processor (31) mostly produce the debug exception like the CPU core (312) and breakpoint built in, it provides the JTAG (Joint Test Access Group) which is the standard interface through the TAP (Test Access Port) controller (311). Therefore, the target interface (23) of in circuit emulator based on the web (2) comprises with the interface logic which the target embedded system (3) can connect to JTAG to the target embedded system (3).

Moreover, the power source for in circuit emulator based on the web (2) comprises the independent power source it can be provided through the target interface (23) from the target embedded system (3).

Figure 3 shows the total operating process of the development system based on the web of the target embedded system according to a preferred embodiment of the present invention.

The IP address of in circuit emulator based on the web (2) is set to 192.168.1.1 which is the virtual private network internet protocol address to the default and the transmission procedure including the file for the development of the target embedded system (3) from the host system (1) according to a preferred embodiment of the present invention etc. is assumed and it illustrates.

Firstly, in order that the development system based on the web of the target embedded system of the present invention is organized, in circuit emulator based on the web (2) is connected through the joint test access group port which is the target embedded system (3) and target interface (23). It connects among the serial port, parallel port, wireless LAN, Ethernet which is the host system (1) and host interface (21) through a one.

In case the host interface (21) of in circuit emulator based on the web (2) supports the wireless LAN interface, the host system (1), moreover, the wireless LAN card is mounted. And in this case, in circuit emulator based on the web (2) and host system (1) are wirelessly connected. It is connected to the target embedded system (3) through the joint test access group port which is the target interface (23) of in circuit emulator based on the web (2).

Next, in the host system (1), the web browser (11) using HTTP which is the communications protocol which is used in order to internet exchange the hypertext document is enforced. It connects to the web page of in circuit emulator based on the web (2) as the IP address on the web browser (11). (S31)

That is, in the host system (1), the web browser (11) is opened. If "192.168.1.1" which is the IP address of in circuit emulator based on the web (2) is inputted on the web browser (11), it connects to the web page which is built in circuit emulator based on the web (2).

In the web page through the web browser (11) of the host system (1), the development of the target embedded system (3) is performed.

Provided is the menu item if connects to circuit emulator based on the web (2) through the web page, in which the web page of in circuit emulator based on the web (2) can be displayed on the web browser (11) of the host system (1), and changing the system parameter including the IP address or the default gateway of in circuit emulator based on the web (2) etc. in the web page.

In case the kinds of machines connect the different computer system and transmit data, it has to change as the establishment of the system information, the IP address and the subnet mask pressing the information operation menu icon including the system parameter etc. to the establishment of the TCP / IP which uses in the standard internet which remarkably transmits data from on a network and makes the inside network possible are inputted.

It respects to connect to the foreign network or do and it establishes path the default gateway (Default Gate Way).

As long as it is stored within the flash memory of in circuit emulator based on the web (2) and it does not change, changed establishment or the system information does not change.

If the IP address or the system parameter of in circuit emulator based on the web (2) is set up or it changes and the system set up is completed, the execution file for the development of the target embedded system (3) etc. are generated in the host system (1) in the web page with the cross compiler. The web page of in circuit emulator based on the web (2) connected through the host interface (21) accepts and it stores in the memory (222). (S32)

It is processed according to the protocol determined with the CPU (221) of in circuit emulator based on the web (2) and it is transmitted to the target embedded system (3) through the joint test access group port which is the target interface (23) of in circuit emulator based on the web (2) and file etc. are stored in the memory (32) sent to the memory (222) of the web page which is built in circuit emulator based on the web (2). (S33)

It can look at in the web page which is built in the execution result of the file etc. recorded as described above, moreover, in circuit emulator based on the web (2).

Moreover, in the above case, as shown in the case of upgrading in circuit emulator based on the web (2) itself is explained, by immediately recording the execution file etc. in the memory (222) of in circuit emulator based on the web (2) generated on the host system (1) it can upgrade.

Moreover, in the web page, the various menu for the development of the target embedded system (3) can be provided. The integrated development environment is implemented on the web server protocol (HTTP) of the upper level of the TCP/IP network protocol through the web browser by providing the assemble, compile, link, execution and debugging function.

As shown in Figure 4, the host system comprising the development system of the target embedded system according to a preferred embodiment of the present invention shows the state setting the host system (1) up the some extent thing as the changed example of the development system based on the web of the target embedded system of fig. 1 through network. It reads in through Yoo the execution file, generated on the home page which is built in circuit emulator based on the web (2) in Yoo, and the other host system (1) on the mobile network, and the mobile network to the memory (222) on in circuit emulator based on the web (2). It can record in the memory (32) of the target embedded system (3) after the conversion of protocol through the target interface (23).

In the upper part, the invention was illustrated based on the preferred embodiment. However, this thing is only illustrative. And it is not thing to limit the invention. Without deviating from the technical mapping of the present invention, change will be obvious to the person skilled in the technical field in which the invention belongs that change from the embodiment illustrated in the upper part or change or adjustment is possible. The attached patent claim intends that change example, the change example, or the to include the adjustment example in the scope of protection of the present invention thing.

#### ■ Effects of the Invention

In the above, specifically, it has the effect that it has the web server built in circuit emulator and the development environment of the target embedded system is provided, the target embedded system can be developed as the web standard language according to the development system based on the web of in circuit emulator based on the web of the present invention illustrated and the target embedded system using this and method regardless of the kinds of machines or the operating system of the host system on the web browser. In addition, the upgrade of the performance improvement of the software which is built in circuit emulator or

the new the appending functions etc can be conveniently upgraded on the web and the debugging function continuously improved without the change of the hardware can be provided. And the new code is downloaded through network and user can upgrade.

Therefore, it has the effect that the integrated development environment through the web browser can be implemented by providing the assemble, compile, link, execution for the development of the target embedded system and debugging function etc. on the web.



### Scope of Claims

#### Claim 1 :

In circuit emulator that is equipped with the host system for the development of the target embedded system and target embedded system and interface and provides the development environment of the target embedded system, wherein in circuit emulator, the web server is built in; it connects with the web browser provided from the host system to the web page of the web server; and the web page develops the target embedded system.

#### Claim 2 :

In circuit emulator based on the web of claim 1, wherein in circuit emulator in which the web server is built in includes CPU enforcing the operating system for the offer of the web based development environment of the target embedded system, including, the conversion of the protocol for communications between execution and the host system and target embedded system etc, and the memory of storing the program about the execution of the above CPU etc.

#### Claim 3 :

A web based in circuit method for emulating comprising the steps of: building the web server within in circuit emulator which is equipped with the host system for the development of the target embedded system and target embedded system and interface and which provides the development environment of the target embedded system; connecting to the web page of the web server as the web browser which is provided from the host system; and in the web page, the target embedded system is developed.

#### Claim 4 :

The development system based on the web of the target embedded system, wherein: in circuit emulator based on the web the host system, and in circuit emulator based on the web are included is connected to the host system and target embedded system to each interface; it connects to the web page of in circuit emulator based on the web as the web browser in the host system; and it transmits file etc. to the target embedded system from the web page. Generated in the host system; as to the host system, the web browser producing the file for the development of the target embedded system etc. is supported; and as to circuit emulator based on the web, the web server transmitting file etc. in the target embedded system and generated in the host system provides the development environment of the target embedded system is built in.

#### Claim 5 :

**The development system based on the web of the target embedded system of claim 4, wherein it transmits to the target embedded system through the target interface after reading in file etc. through the host interface and going through the conversion of protocol in the web page of in circuit emulator based on the web.**

**Claim 6 :**

**The development system based on the web of the target embedded system of claim 4 or 5, wherein the host interface connecting the host system and in circuit emulator based on the web is USB interface.**

**Claim 7 :**

**The development system based on the web of the target embedded system of claim 4 or 5, wherein the host interface connecting the host system and in circuit emulator based on the web is the serial interface.**

**Claim 8 :**

**The development system based on the web of the target embedded system of claim 4 or 5, wherein the host interface connecting the host system and in circuit emulator based on the web is the Ethernet interface.**

**Claim 9 :**

**The development system based on the web of the target embedded system of claim 4 or 5, wherein the host interface connecting the host system and in circuit emulator based on the web is the wireless LAN interface.**

**Claim 10 :**

**The development system based on the web of the target embedded system of claim 4 or 5, wherein the target interface connecting in circuit emulator based on the web and target embedded system is the JTAG interface.**

**Claim 11 :**

**The web based development method of the target embedded system wherein it connects to the web page of in circuit emulator based on the web in which the web server providing the development environment of the target embedded system to the web browser is built in the host system in which the web browser producing the file for the development of the target embedded system etc. is supported; and file etc. are transmitted to the target embedded system from the web page. Generated in the host system.**

**Claim 12 :**

**The web based development method of the target embedded system of claim 11, wherein the target embedded system the electrical transmission including file etc. generated in the host system transmits to the target embedded system through the target interface after reading in file etc. through the host interface and going through the conversion of protocol in the web page of in circuit emulator based on the web.**



Drawings

Fig. 1

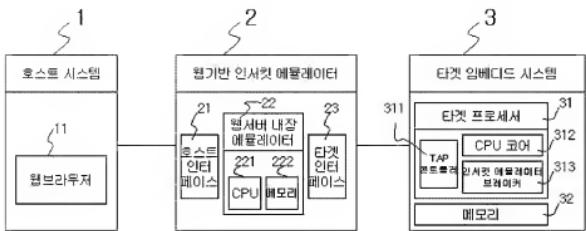


Fig. 2

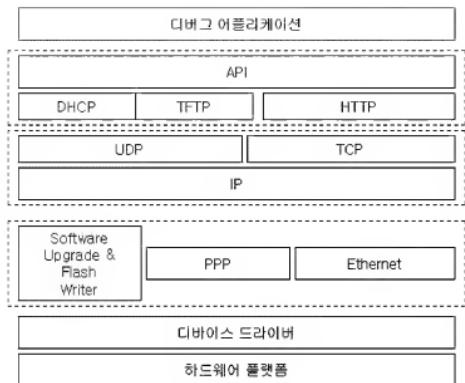


Fig. 3

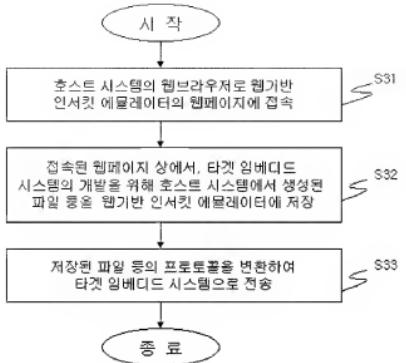


Fig. 4

